BIODEGRADABLE SUBSTANCES:-

Substances that are broken down by the biological processes are said to be biodegradable. These substances are decomposed through the actions of fungi, bacteria and other living organisms. Temperature and sunlight also play an important roles in the decomposition of biodegradable plastics and other substances.

A 'biodegradable' has the ability to break down, safely and relatively quickly, by biological means into the raw materials of nature and disappear into the environment. These products can be solids biodegrading into the soil or liquids biodegrading into water. Biodegradable plastic is intended to break up when exposed to micro-organisms. Examples : Food refuse, tree leaves urine and faecal matter, sewage agricultural residue, paper, wood, cloth, cow-dung, etc.

NON-BIODEGRADABLE SUBSTANCES:-

Substances that are not broken down by biological processes. These substances may be in solid, liquid or gaseous form. These substances are inert and simply persist in the environment for a long time or may harm the various members of the ecosystem.
Example ; these includes DDT, insecticides, pesticides, mercury, lead, arsenic, aluminimum, plastics, polythene bags, glass, radioactive wastes.
These non-biodegradable wastes are major pollutants of the environment.

HARMFUL EFFECTS OF BIODEGRADABLE AND NON-BIODEGRADABLE SUBSTANCE:-

1. This waste destroyed the natural beauty and surroundings become dirty.
2. Decomposition of these wastes results in the production of foul smell, which spreads to surroundings areas.
3. These wastes may also block the drains creating pools of waste which becomes the breeding sites of mosquitoes. The letter is carriers of diseases like malaria and dengue.

EFFECTS OF NON-BIODEGRADABLE WASTES;-

1. These wastes are very harmful. They enter the food chains and their concentration goes on increasing from one trophic level to the next. This leads to biological magnification and result in harmful effects in human beings and other animals.
2. Dumping these wastes affects the soil fertility and subsequently reduces the crop yield.
3. These substances are inert and persist in the environment for a long time or may harm the various members of the ecosystem

Difference Between Biodegradable and Non-Biodegradable wastes.

Biodegradable Wastes	Non-biodegradable
1. The wastes are broken down naturally by microbial action 2. Biodegradation forms harmless and nonpoisonous products. 3. They release raw materials back to nature. 4. They pollute the environment only when they are produced in quantity beyond the capacity of	1. The wastes are not broken down by the microbes. 2. No such action is possible. 3. They do not release raw materials. 4. Non-biodegradable wastes pollute the environment even in small quantity.

environment to degrade them. 5. They seldom accumulate though their concentration can increase. 6. Bioconcentration does not occur. 7. Recycling is possible both naturally or through human efforts.	5. They continue to accumulate. 6. Bioconcentration or biomagnifications occurs when wastes enter food chains. 7. Recycling is possible only through human efforts.

ECOSYSTEM

Ecosystem can be defined as followings:

Ecosystem is a structural and functional unit of the biosphere consisting of a community of living beings and the physical environment; both interacting exchanging materials between them also, an ecosystem is a relatively self containing and distinct community of organisms (plants and animals) and their environment. In an ecosystem, energy and matter are continuously exchanged between living and non-living components.

An ecosystem can be both natural or man-made. Some examples of natural ecosystems are grass land, a forest, a sea, a river, a desert, a mountain, a pond, a lake etc.

The desert, grass land and mountain represent the terrestrial ecosystem (land-based ecosystem).

The ponds, rivers, lakes and sea represent the aquatic ecosystem (water- based ecosystem).

Man – made or artificial ecosystems are garden, crop fields, park aquarium, etc.

COMPONENTS OF ECOSYSTEM:-

Every ecosystem has two main components:

(i) Abiotic components and (ii) Biotic components.

ABIOTIC COMPONENTS:-

These are non- living components of an ecosystem. These include:

Physical environment:

(i) Edaphic factors like soil texture, topography, water and air.

(ii) Inorganic substances like carbon dioxide, nitrogen, oxygen, water, phosphorus, sodium, potassium, and calcium. These are involved in the cyclic of materials in the ecosystem.

(iii) Organic compounds like proteins, carbohydrates, and lipids. These largely form the living body and link the abiotic and biotic components.

Climatic factors: these are sunlight, temperature, pressure, humidity, moisture, rainfall, etc. these factors affect the distribution of the organisms.

BIOTIC COMPONENTS:-

The biotic component of an ecosystem is a community of living organisms (like plants, animals and microbes). The biotic community of an ecosystem includes the following:

PRODUCERS:-

These are the organisms which are able to systhesise their food. They are mainly green plants which make their food with the help of solar energy. All green plants have the capability to absorb the sun energy and convert simple inorganic raw materials like carbon dioxide and water into carbohydrates, which give them food. This process is

called photosystheis. Therefore, all green plants are called producers. They are also called autotrophs.

CONSUMERS:-

They are organisms which consume other organisms or their products as their food. All animals belong to this category. The consumers depend upon producers for their food directly or indirectly. They get their food either by eating other organisms or their products. For example, man, goat, deer, fish, lion, cow, buffalo, etc., are common consumers.

The consumers can be classified into the following three types:

(i) **HERBIOURS:-** These are organisms (animals) which get their food by eating the producers (or plants) directly. Herbivores are also called first order consumers. Some common examples of herbivores are: deer, rabbit, rat, squirrel, goat, cattle, etc.

(ii) **CARNIVORES:-** These are organisms (animals) which consume other animals. Therefore, carnivores feed on the flesh of harbivores. These are also called primary carnivores or second order consumers. Some common examples are snake, wild cat, jackal, frog, some birds, fishes, etc.

There are animals which pray upon primary carnivores. They are called second order consumers or third order consumers. For example, owl, peacock, tiger, lion, etc. some second order carnivores may be eaten by third order carnivores. The carnivores which are not preyed upon further are called top carnivores. For example, lion is a top carnivore.

(iii)**OMNIVORES:-** The organisms which feed on both plants and animals are called omnivores. Human beings are common example of omnivores because they eat both plants (e.g., pulses, grams, oilseeds, fruit, etc.) animal products (milk, meat, egg, etc).

DECOMPOSERS:-

These are organisms which feed on the dead bodies of plants and animals. These are micro-organisms like bacteria and fungi which break down the complex organic compounds present in dead organisms like plants and their products into a simpler substance. These are also known as micro-organisms or saprotrophs. These are also called reducers.

IMPORTANCE OF DECOMPOSERS:-

(I) Decomposers help in disposing off the wastes and dead bodies of plants and animals. Therefore, they clean the environment and create space for living of newer generations of organisms.

(II) The decomposers release minerals and other raw materials trapped in organic matter. These are picked up by plants. This also help to maintain the fertility of soil.

(III) The decomposers produce some acids which are useful in solubilisation of some minerals.

(IV) Decomposers help in recycling the materials in the biosphere so that the process of life may go on and on like an unending chain.

FUNCTIONS OF AN ECOSYSTEM:-

(i) Ecosystem indicates available solar energy and the efficiency of an ecosystem to trap the same.

(ii) It gives information about the available essential minerals and their recycling periods.

(iii) It provides knowledge about the web of interactions and interrelationship amongst the various populations as well as between the populations and the abiotic environment.

(iv) It helps human beings to know about conservation of resources, protection from pollution and inputs required for maximizing productivity.

(v) In the ecosystem, two processes of energy flow and biogeochemical cycles (nutrients movement) proceed side by side. The energy flow is uni-directional while the movement of nutrients is cyclic.

FOOD CHAIN:-

In the biosphere, food relationships exist between different living organisms. They interact with one another for their food preparation as well as food consumption. Some organisms consume other organisms and they are in turn consumed by others, thereby forming a chain. In this chain, energy transfer takes place, and it is called a food chain.

A food chain can be defined as follows:

Food chain is sequential process which represents "who eats whom". In terms of energy, sequence of living organisms in a community in which one organism consumes another organism to transfer food energy is called a food chain. In a food chain, uni-directional transfer of energy takes place.

EXAMPLES OF FOOD CHAINS:-

Simple food chain operating in a grass land or forest:

Grass (Producer) → Deer (Herbivore) → Lion (Carnivore)

In this food chain, grasses represent the producers (first tropic level). Grass synthesize their own food by the process of photosynthesis. Grass are eaten up by deer, which represent the herbivores or the primary consumers. Deer in turn are consumed by lions, the carnivores or the secondary consumers.

A food chain in grassland which has four steps is:

Grass (Producers) → Insect (Herbivores) → Frog (Carnivores) → Eagle (Secondary Carnivore)

SIGNIFICANCE OF FOOD CHAINS:-

(i) The study of food chains helps in understanding food relationships and interactions among the various organisms in an ecosystem. The food chains transfer energy and materials between various living components of an ecosystem.

(ii) The food chains transfer energy and materials between various living components of an ecosystem or biosphere.

(iii) The food chains give dynamicity to an ecosystem or biosphere.

(iv) The movement of toxic substances like pesticides, weedicides, etc., through food chains can prove very harmful.

FOOD WEB:-

The various food chains, operating within an ecosystem or the biosphere cannot function in isolation. Many of these food chains are interconnected by organisms which are a part of more than one food chains form a network with interconnections and linkages.

The network of various food chains which are interconnected at various tropic levels is called food web.

In a food web, one organism may occupy position is more than one food chain. An organism can obtain its food from different sources and in turn may be eaten up by different types of organisms.

TROPHIC LEVELS:-

The various levels or steps in a food chain at which the transfer of food or energy takes place from one generation to another are called trophic levels. The number of triohic levels in a food is equal to the number of trophic levels in a food chain is equal to the number of steps in the food chain.

The various trophic levels are given below:

i. The plant or the producers constitute the first trophic level.
ii. The herbivores or the primary consumers form the second trophic level.
iii. Carnivores or the secondary consumers make up the third trophic level.
iv. Large carnivores or the taritiary consumers which feed upon the small carnivores constitute the fourth trophic level.

FLOW OF ENERGY:-

Energy is used and conveyed from one trophic level to another is a food chain. This is called flow of energy. Green plants capture about 1% of the solar energy incident on the earth through the biochemical process of photosynthesis. A part of this trapped energy iss used by plants in performing their metabolic activities and some energy is released at heat into the atmosphere. The remaining energy is chemical energy stored in the plants as 'carbohydrates'.

When plants are eaten up by herbivores, the chemical energy stored in the plants is transferred to these animals. These animals (herbivores) utilize some of this energy for metabolic activities, some energy is released as heat and the remaining energy is stored.

The process of energy transferred is similarly repeated with carnivores and so on.

CHARACTERISTICS OF ENERGY TRANSFER:-

The following are the characteristics of energy transfer in the biosphere:

(i) Energy is supplied by the sun and it is not created in the biosphere. Energy is only converted from one form to another in the biosphere.
(ii) There is a continuous transfer of energy from one trophic level to the next in a food chain.
(iii) At each trophic level, some of the energy is utilized by the organisms for their metabolic activities.
(iv) At each trophic level, some amount of energy is utilized for the composition of decomposers.
(v) At each trophci level, there is loss of energy, which goes into the environment and remains un-utilized.
(vi) At each trophic level, the amount of energy available is less than that available at the previous level.

TEN PERCENT LAW:-

According to this law only ten percent of the energy entering a particular trophic level is stored and the remaining is lost during energy transfer. In the words, the energy available at each successive trophic level is only 10 percent of the previous level.

e.g.,

Sun energy 1000 J Plant 10 J Dear 1 J Lion

For example, suppose 1000 J of solar energy is received by green plants, then only 1% of solar energy available on earth is utilized by plants. So only 10 J (1% of 1000 J) is trapped by plants and the rest 990 J of energy is lost to the environment. So, plant utilizes only 10 J of energy.

Next, only 10% off the 10 J energy of plants, that is, 1 J, is available to the herbivore animal while 9 J is lost to the environment.

Against, just 1% of the 1 J of energy of herbivore animals is utilized by carnivore animals. Thus, carnivore animals have only 0.1 J of energy while 0.9 J is lost to the environment.

DEPLETION IN OZONE LAYER:-

The upper reaches of the atmosphere extend up to 600 km above the earth. At about 10-50 km above the earth is a region called the ozonosphere, where there is a relative abundance of the gas called ozone. The ozone layer protects life on the earth by blocking most of the sun's harmful ultraviolet rays.

The ozone molecule is made up of three atoms of oxygen. The chlorine atom attacks ozone and takes one oxygen atom away from ozone, to chlorine monoxide combines with another oxygen atom to form oxygen and chlorine.

When chlorine becomes free, it will combine with another molecule of ozone and break the bonds between its oxygen atoms, thus, reducing the amount of ozone. The newly formed oxygen molecules cannot prevent the sun's ultraviolent rays from reaching the earth. Exposure to these rays can lead to various diseases like cataract and skin cancer.

The source of chlorine are compounds like fluorocarbon and chlorofluorocarbon (CFC). Chlorofluorocarbon wafts up to the atmosphere. Very high up in the atmosphere, this compound breaks up and starts the demolition of ozone.

BIOLOGICAL MAGNIFICATION:-

Chemicals like DDT are widely used to kill pests. These chemicals can get into the food chain and cause great harm. They enter the food chain through aquatic life forms like plankton, which are eaten by fishes, which in turn might be eaten by birds and other consumers higher up in the food chain. These chemicals are not metabolized in the body of animals and hence accumulate in their tissues. As the chemical passes on from one level to the next in the food chain, the concentration of the chemical retained by organisms at each level increases. This is called biological magnification. This kind of process was observed around Lake Michigan in North America. DDT was sprayed extensively around the lake in 1942 to kill mosquitoes, which caused malaria. After almost twenty years, ie., in the early sixties, a dramatic fall in the number of pelicans (a type of bird) was noticed.

MODES OF WASTE DISPOSAL :

- The disposal of waste should be done scientifically. There are different techniques of waste disposal, which depends upon the nature of the waste.
- Most solid wastes are buried in urban areas as land fills.
- Some solid wastes like plastics, metals, papers are recycled. Industrial wastes are treated in special plants and valuable wastes are recycled.
- Domestic wastes are used as manure for plants, including trees after compositing.
- Waste coming out of industries, such as metals can be melted and recycled into solid metal once again.
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- Molten plastic waste mixed with asphalt can also be used for making roads. These reduce pollution.
- The volume of the waste can be reduced by incineration or burning at high temperature.
- Biogas and manure can be prepared from the biodegradable waste, which cost much less than other fuel and fertilizers.

STEPS TAKEN TO LIMIT DAMAGE TO OZONE LAYER :

The damage of ozone layer leads to variation in rainfall, ecological disturbances and other effect in global food supply. To limit this damage, U.N.E.P, United Nations environment programme has forged an agreement to freeze for CFC production at 1986. All t he developed and developed countries are taking keen interest to work in this regard to save the ozone layer from further depletion.